FINAL REPORT

BASELINE AIR QUALITY AND NOISE HUMAN HEALTH RISK ASSESSMENT EXECUTIVE SUMMARY

Prepared for:

City of Long Beach
Department of Health and Human Services
2525 Grand Avenue
Long Beach, CA 90815

Submittal Date: January 18, 2005
MWH Project Number: 1890882.0101

Prepared by:

MWH

20902 Bake Parkway
Suite 100
Lake Forest, CA 92630

AAC

Alliance Acoustical Consultants, Inc.
9272 Jeronimo Road
Suite 101
Irvine, CA 92618

CONTRIBUTORS

The principal authors are acknowledged below for their effort in the development, execution, and documentation of the baseline human health risk assessment.

Mr. Danny Kringel
Principal Air Quality Scientist
MWH Americas, Inc.

Mr. Robert Mantey
Principal Consultant
Alliance Acoustical Consultants, Inc.

Dr. Lee Schull
Principal/Practice Director
Health, Ecology and Risk Practice
MWH Americas, Inc.

Mr. Larry Hottenstein
National Director of Air Services
MWH Americas, Inc.

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

List of Figures

TABLE OF CONTENTS (Cont.)

List of Tables

GLOSSARY OF TERMS

AB2588	AB2588 Air Toxics 'Hot Spots' Act – California regulation to control the release of air toxic pollutants
ANCA	Federal Aircraft Noise Capacity Act – Federal legislation designed to reduce airport noise to acceptable levels
AQE	Air Quality Element – City planning document for air quality studies
BS	Black Smoke – Term to define particulate soot
CAAQS	California Ambient Air Quality Standards – California standards to protect public health
CAPCOA	California Air Pollution Control Officers Association – Local Air Quality District leaders formed to provide guidance with the AB2588 Regulations
CARB	California Air Resources Board – Primary state air quality regulatory enforcement agency
CEQA	California Environmental Quality Act – California legislation to control adverse environmental impact through the planning process
CHS	Children's Health Study – Prospective study to evaluate pollutant concentrations with various health conditions
CNEL	Community Noise Equivalent Level - A specialized noise metric that provides a standardized, 24-hour-based noise value. The CNEL value is an energy-average of the A-weighted day-evening-nighttime sound levels with time-of-day weighting adjustments to account for increased sensitivity of people to intrusive noise in the evening and nighttime hours. The adjustments are to add 5 dB to the actual sound level between the hours of 7 p.m. to 10 p.m. and to add 10 dB to the actual sound level between the hours of 10 p.m. and 7 a.m. (the following morning). For purposes of airport planning and compliance, the CNEL is typically calculated for longer periods; monthly, quarterly, and yearly averages. In all cases, the CNEL for the airport is the energy-average (with time-of-day adjustments) for the noted reporting period.
dB	Decibel - Measure of the sound pressure, defined as 20 log10 (p/p_0) where p is the root mean square (rms) value of the sound pressure in Pascals and p_0 is the reference pressure of 20 µPa for measurements in air

GLOSSARY OF TERMS

dBA	'A'-weighted sound pressure level in decibels; the 'A' weighting scale is a frequency response characteristic which approximates the response of the human auditory system equivalent continuous sound pressure
dB(A) L_{eq} level	It is the steady dB(A) level which would produce the same 'A'-weighted sound energy over a stated period of time
dB(A) L_{eq} (8 hr)	Is the equivalent continuous sound pressure level measured or calculated over a period of 8 hours
DHHS	Long Beach Department of Health and Human Services
DPM	Diesel Particulate Matter – The particulate emissions from combustion exhaust from diesel run vehicles
EC	Elemental Carbon – the carbon matter in particulate exhaust in its purest form, often used as an identifier or surrogate for DPM
FAA	Federal Aviation Administration – Federal agency in charge of all aircraft travel
FEV_{75}	Forced Expiratory Flow Rate at 75% of FVC. Used to measure lung performance by measuring the flowrate of air after 75 percent of the capacity has been exhaled
FEV_1	Forced Expiratory Volume in one second. Used to measure lung performance by measuring the volume of air exhaled in the first second
FVC	Force Vital Capacity – Used to measure lung performance by measuring the maximum volume of air during inhalation
HAPS	Hazard Air Pollutants – Federally regulated toxic air pollutants
HDV	Heavy Duty Vehicle – Large diesel vehicles typically used for hauling or construction
HRA	Health Risk Assessment

GLOSSARY OF TERMS

IEPA	Illinois Environmental Protection Agency – Lead state agency for air quality, comparable to CARB
IRIS	Integrated Risk Inventory System – Database of toxic parameters for a wide variety of toxic air pollutants
JWA	John Wayne Airport
LAX	Los Angeles International Airport
LBMC 16.43	Long Beach Municipal Code – Municipal legislation defining the Long Beach Airport Noise Compatibility Ordinance
LGB	Long Beach Airport
LRI/W/A	Lower Respiratory Infections with wet cough and wheeze or asthma. Used to differentiate variances in respiratory infections
LRI/wc	Lower Respiratory Infections with wet cough and wheeze. Used to differentiate variances in respiratory infections
LTO	Landings and take-offs. Used in aviation to describe the number of visits an aircraft makes at an airport. One cycle includes one landing and one take-off
MAQE	Model Air Quality Element – SCAQMD updated AQE to assist cities in evaluating air quality concerns during their planning process
MATES II	Multiple Air Toxics Exposure Study II – The SCAQMD field program to evaluate potential toxic health risks from ambient air monitoring and modeling
MMEF	Maximal Midexpiratory Flow - Used to measure lung performance by measuring the maximum volume rate during exhalation
NAAQS	National Ambient Air Quality Standards – Federal standards designed to protect public health
NIST	National Institute of Science and Technology

GLOSSARY OF TERMS

NO_2	Nitrogen Dioxide – Brownish gas that is regulated by the federal and state regulatory agencies
NO_x	Oxides of Nitrogen – A group of nitrogen compounds that convert to NO_2 and assist in ozone formation
O_3	Ozone – Colorless gas regulated by the federal and state regulatory agencies
OC	Organic Carbon – Any organic carbon material
OEHHA	Office of Environmental Health Hazard Assessment – California agency developed to investigate toxicity of potential harming compounds
PAH	Polycyclic Aromatic Hydrocarbons – Group of toxic gaseous hydrocarbons
PEFR	Peak Expiratory Flow Rate – Used to measure lung performance by measuring the peak maximum volume rate during exhalation
PM_{10}	Particulate Matter less than 10 Microns – Small particulate matter that can reach the bronchial tracts of the lungs.
$PM_{2.5}$	Particulate Matter less than 2.5 Microns – Smaller particulate matter that can reach the bronchial tracts of the lungs.
RBDM	Risk-Based Decision Making – A procedure to manage decision making by prioritizing risks
SCAB	South Coast Air Basin – Southern California coastal region that is bounded by the mountains to the north east and includes Los Angeles, Orange, and portions of Riverside and San Bernardino Counties
SCAQMD	South Coast Air Quality Management District – Regional regulatory air quality enforcement agency
SEL	Sound Exposure Level - Normalized to a 1-second duration dB(A) L_{eq}; used to quantify short-duration noise events
SHC	Saturated Hydrocarbons – Group of gaseous hydrocarbons that assist in the formation of ozone
SIP	State Implementation Plan – A federally mandated plan to lower the ambient air quality concentration to below NAAQS

GLOSSARY OF TERMS

URF	Unit Risk Factor – A toxicity factor to relate concentration of a specific compound to a risk of contracting cancer
URI	Upper Respiratory Infections
USEPA	U.S. Environmental Protection Agency – Federal enforcement agency to oversee all air quality actions within the United States
VOC	Volatile Organic Compound – Hydrocarbon-based gaseous compounds that assist in the formation of ozone
WHO	World Health Organization

EXECUTIVE SUMMARY

INTRODUCTION

Long Beach is the fifth largest city in the State of California and the 34th largest city in the United States. The City occupies a land area of approximately 52 square miles, including 6.5 miles of shoreline, and services a population of approximately 481,000. The City provides a full range of services to its community, as well as providing entertainment activities that attract a large tourist market.

Long Beach also has a natural harbor for the shipping industry and throughout the years, the adjacent Ports of Long Beach and Los Angeles have become the largest port system in the Western Hemisphere. As part of the shipping industry, the movement of cargo has increased the need for trucks and rail to and from the Port. The Long Beach Airport has been in operation for many years, seeing both an increase and decrease in major commercial use over this period. Currently, the airport is in a growth period, with up to 41 commercial flights per day, after a significant decrease in recent years.

Due to the tremendous growth that has allowed this city to prosper, the citizens of Long Beach have addressed concerns that increased air and noise pollution within the City limits are adversely affecting their health. The primary concern centers around the emission of pollutants from the major transportation sources (freeways, ports, airport, and truck/rail traffic), as well as the noise from the airport, and their impact on the residents. For each of these areas, the major contributors to air pollution are from by-products of combustion, primarily oxides of nitrogen (NO_x), volatile organic compounds (VOCs), small particulates (i.e., particles less than 10 microns - PM_{10} and particles less than 2.5 microns – $PM_{2.5}$), and air toxics. NO_x not only transforms into nitrogen dioxide (NO_2), but also is one of the primary precursors to the formation of ozone (O_3).

In order to adequately address these concerns, the Long Beach City Council directed the Department of Health and Human Services (DHHS) to conduct a comprehensive assessment to determine whether there is the potential for adverse health effects from environmental pollution on its population. To conduct a scientifically defensible study to assess the health effects from these sources would require an extensive, multi-year field program, followed by exhaustive data analysis to conduct the assessment. Currently, the DHHS has no reports that demonstrate an unusually high number of cases attributable to air quality or noise health effects that would warrant such a study. Thus, as an initial step in addressing the City's request, the DHHS commissioned a study to evaluate whether there is existing information that either directly links air quality conditions within Long Beach to increased health impacts or can be utilized to relate current conditions within Long Beach to a potential increase in health impacts. The results of the commissioned study are incorporated into the baseline health risk assessment (HRA).

DHHS contracted MWH, Americas, Inc. (MWH), in association with Alliance Acoustical Consultants, Inc. (AAC), to conduct a baseline health risk assessment (HRA). The overall study was designed to conduct a literature search of available information relating to air quality within the City and airport noise, derive input from the public relating to alternative sources of information and community concerns, conduct an initial review of the data for relevancy, conduct critical reviews of relevant data, and assess the baseline health risk on the residences of Long Beach. Due to the different nature of analysis, the baseline HRA was separated into two different evaluations: Baseline Air Quality HRA and the Baseline Noise HRA.

BASELINE AIR QUALITY HRA

Methodology

The initial review was conducted to assess whether the various information sources contained scientifically based data that either had direct relevance to the sources within Long Beach or had information that could be used to directly relate the data to potential health impacts. The review keyed on information such as monitoring, emissions, predictive modeling, or data correlation.

In addition to the transportation sources, under the requirements of the AB2588 Air Toxics "Hot Spots" program, the assessment reviewed existing HRAs of businesses that emit hazardous pollutants having the ability to affect the City's residents.

The air quality assessment obtained over 80 sources of information (See Appendix A) including reports, ambient data, articles, and studies relating to either the Long Beach region or sources that were similar to the Long Beach transportation sources.

The focus of this baseline HRA was to identify and assess the existing scientifically-sound information that is either directly relevant to the Long Beach area or has direct implications to the Long Beach region relating to the potential impacts within its community. These include:

1. The assessment of national and California air quality standards with respect to the ambient air quality within the city.
2. The assessment of recent scientific studies involving potential links of NO_2, O_3, PM_{10} and $PM_{2.5}$ to increased health effects.
3. The assessment of studies associated with various toxic emissions, including DPM, potentially affecting the Long Beach area.

Thirty-five sources of information were further evaluated for the HRA. The data reports were carefully reviewed and analyzed to assess whether the data were derived upon scientifically sound bases, were verifiable, represented reasonable assumptions of actual conditions, and accurate. The air quality risk assessment was primarily based upon the ability to evaluate the exposure to Long Beach residences and the pollutants' toxicity.

Monitored data were considered to be the most direct method of evaluating exposure, and thus, baseline risk. Predictive modeling was also used to assess the baseline risk analysis.

The most direct, and accurate, method to assess exposure is by direct measurement. The SCAQMD operates 30 continuous air-quality monitoring stations throughout SCAB to evaluate ambient concentration zones throughout the basin. Within the Long Beach City limits, the SCAQMD operates a single monitoring system (representing Zone 4) to measure the ambient air quality for regulatory purposes. This monitor is located in the Bixby Knolls area approximately one mile east of the I-710 and one-half mile north of the I-405 and is considered to be a representative average for the Long Beach area.

This location has been used as one of the six state-sponsored monitoring stations in the basin by CARB from 1990-1997. This location has also been used in the MATES II study and currently is being used in the MATES III monitoring program, as one of the 10 stationary monitoring stations, to measure various air toxics. The meteorological data from this station is also used to evaluate potential toxic emissions in the AB2588 Toxic "Hot Spots" program. The Long Beach Monitoring Station represents the most comprehensive data available citywide.

Several studies were identified as having a direct relationship to the Long Beach region. These include the SCAQMD MATES II Study, ship-specific emission inventory of marine vessels at the Port of Long Beach, a recently completed emissions inventory for shore-side equipment at the Port, and a baseline emissions inventory for airports within the South Coast region, including the Long Beach Airport. In addition, there have been 13 facilities within the Long Beach region that have conducted site-specific HRAs in compliance with the AB2588 Air Toxics 'Hot Spots' requirements. Finally, Dr. Thomas Mack, with the University of Southern California, has conducted an extensive review and analysis of cancers within Los Angeles County, including the Long Beach area. The following provides a summary of each of the studies directly relevant to Long Beach.

Fourteen additional studies were identified and selected to supplement the data sources above, and although they did not necessarily have direct information relative to Long Beach, the data provided comparative information relevant to the sources under review. These studies included several analyses of the Children Health Study (CHS) data, the assessment of air pollution near freeway systems, and several airport-related studies.

Findings

The key results of the air quality baseline HRA are as follows:

1. South Coast Air Quality Management District (SCAQMD) ambient data for the Long Beach monitoring station have shown that the ambient concentrations of NO_2, PM_{10}, and O_3 were generally lower that other sites within the South Coast Air Basin (SCAB) and that the concentrations were within the National Ambient Air Quality Standards (NAAQS), and a majority were below the California Ambient Air Quality Standards

(CAAQS). From 1994, the maximum concentrations for these pollutants have either generally decreased or have remained constant (See Table ES-1). This is primarily due to the coastal positioning of Long Beach in combination with the prevailing westerly winds. Recent monitoring of $PM_{2.5}$ shows the maximum 24-hour concentration is below the Federal standard. However, the annual average concentration for the first year of monitoring exceeds both the Federal standard (15 ug/m^3) and the California standard (12 ug/m^3).

2. The data from the MATES II program and ongoing monitoring at the SCAQMD Monitoring Station in Bixby Knolls have also shown that the ambient air toxic concentrations have steadily decreased over the years, especially the elemental carbon (EC) concentration, which is assumed to be a surrogate for diesel particulate matter (DPM). The associated risks from the ambient monitoring shows a 25 percent lower overall risk in Long Beach than the average of the entire SCAB.
3. MATES II modeling data indicate that Long Beach is predicted to have one of the highest risks, due to the estimated diesel particulate emissions from the Ports of Los Angeles and Long Beach. The modeling of predicted emissions from the Southern California region suggests that Long Beach has high predicted excess cancer risks, primarily based upon the Ports' emissions. However, this is rather contradictory with the limited observed concentrations (and resultant excess cancer risks) and no attempt was made to specifically analyze the differences between ambient and predicted concentrations at the Long Beach monitoring site.
4. Marine vessel emissions developed from recent studies illustrate that the emissions from the Ports are a significant contributor to the overall emission levels within the SCAQMD jurisdiction. Estimates of particulate emissions from diesel combustion may have the potential for localized health risk impacts, although there has been no credible studies to link the emissions to adverse health effects from Port operations. It has been estimated that the emissions from support-related activities at the Ports have minimal impact in comparison to the levels from the marine vessels.
5. Data relating to comparable airport operations show that toxic emissions from the aircraft and support equipment contribute only a fraction of the overall risk from ambient air pollution. In the Long Beach region, an expected excess cancer risk from the Long Beach Airport emissions close to the property boundary is expected to be between 10 to 20 in a million population over a 70-year time span, which is primarily based upon the high use of ground support equipment at airports. Residential risks were calculated for areas where residences would be continuously exposed to the maximum concentration for 24-hours per day, 365 days per year, for a total period of 70 years. Based upon the restricted flights and the design of the land use at Long Beach Airport, ground support equipment is limited and, thus, may expect even lower potential excess cancer risk levels.

Table ES-1. Summary of Air Quality Measurements for the Long Beach Region from 1994 through 2002*

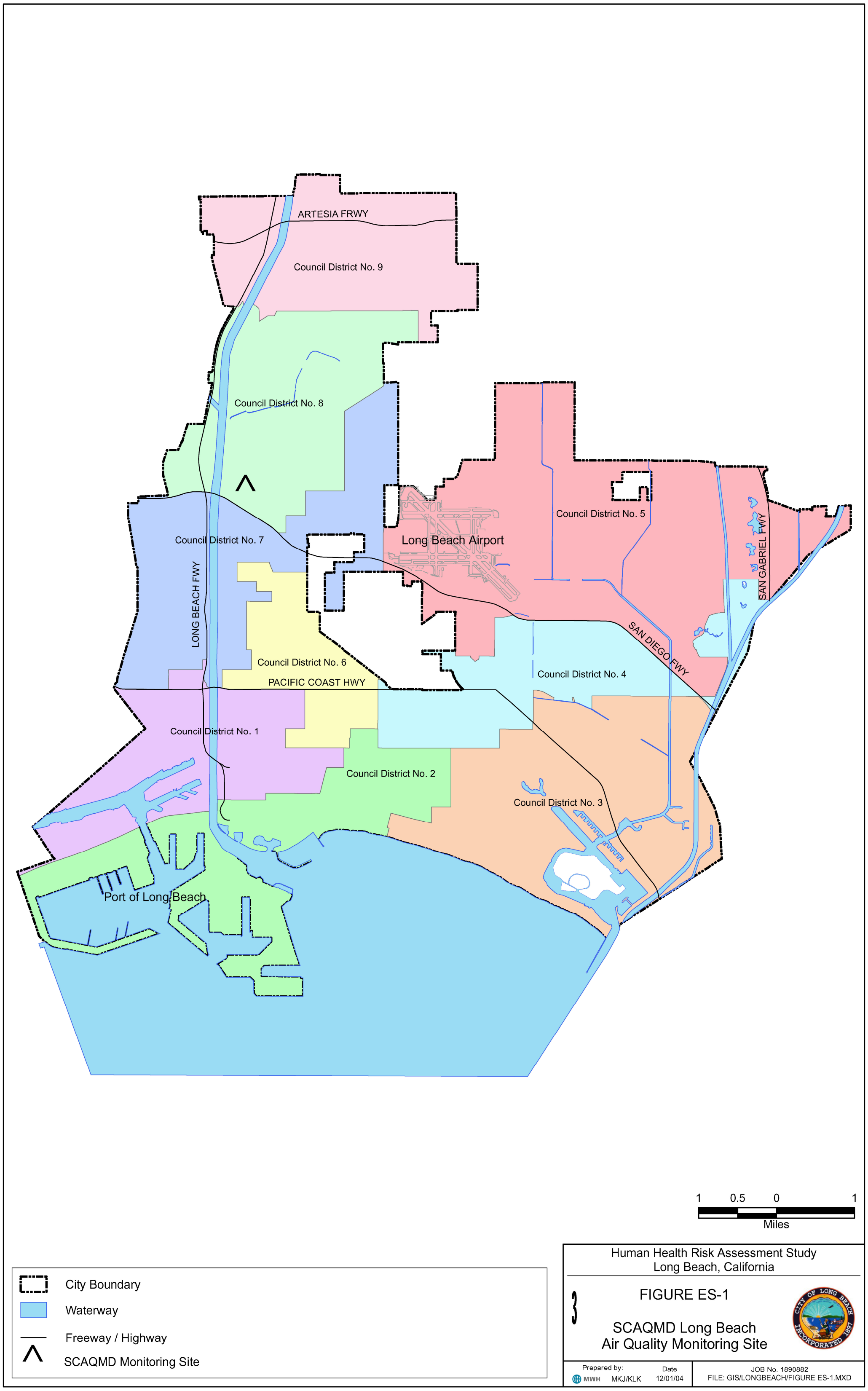
	Nitrogen Dioxide 1-Hour (ppm)	Annual (ppm)	PM10 24-Hour (ug/m3)	Annual (ug/m3)	PM2.5 24-Hour (ug/m3)	Annual (ug/m3)	Ozone 1-Hour (ppm)	8-Hour (ppm)
Federal Standard	-	0.053	150	50	65	15	0.12	0.08
California Standard	0.25	-	50	30	-	12	0.09	-
1994								
Maximum Concentration	0.22	0.0322	**81**	**33**	-	-	**0.11**	-
Number of Days Exceeding Federal	-	0	0	0	-	-	0	-
Number of Days Exceeding State Standard	0	-	11	1	-	-	3	-
1995								
Maximum Concentration	0.18	0.0305	**136**	**31.2**	-	-	**0.12**	-
Number of Days Exceeding Federal	-	0	0	0	-	-	0	-
Number of Days Exceeding State Standard	0	-	8	1	-	-	3	-
1997								
Maximum Concentration	0.17	0.028	**79**	**33.8**	-	-	**0.11**	0.09
Number of Days Exceeding Federal	-	0	0	0	-	-	0	3
Number of Days Exceeding State Standard	0	-	4	1	-	-	6	-
1998								
Maximum Concentration	0.15	0.0295	**66**	**30.3**	-	-	0.09	0.07
Number of Days Exceeding Federal	-	0	0	0	-	-	0	0
Number of Days Exceeding State Standard	0	-	7	1	-	-	0	-
1999								
Maximum Concentration	0.13	0.0295	**69**	**33.4**	-	-	**0.15**	0.09
Number of Days Exceeding Federal	-	0	0	0	-	-	1	1
Number of Days Exceeding State Standard	0	-	6	1	-	-	1	-
2000								
Maximum Concentration	0.13	0.0275	**74**	**33.4**	-	-	**0.1**	0.075
Number of Days Exceeding Federal	-	0	0	0	-	-	0	0
Number of Days Exceeding State Standard	0	-	9	1	-	-	1	-
2001								
Maximum Concentration	0.11	0.025	**75**	**34.4**	-	-	**0.098**	0.08
Number of Days Exceeding Federal	-	0	0	0	-	-	0	0
Number of Days Exceeding State Standard	0	-	8	1	-	-	1	-
2002								
Maximum Concentration	0.13	0.0298	**74**	**34.1**	62.7	19.5	0.084	0.06
Number of Days Exceeding Federal	-	0	0	0	0	1	0	0
Number of Days Exceeding State Standard	0	-	5	1	-	1	0	-

* - Data obtained from the SCAQMD Long Beach Monitoring Station located in Bixby Knolls.

6. The review of potential health impacts from the operation of the 13 site-specific facilities within the Long Beach region found no adverse health effects are expected on the Long Beach residences. Due to their relative positions within the City and the areas of maximum estimated excess cancer risks from these facilities, the likeliness of cumulative health risks from overlaying impacts are minimal, if not nil.
7. The review of the Southern California cancer study by Dr. Thomas Mack has indicated unusually high incidence of cancer identification in several areas within Long Beach, termed as cancer clusters, for a single specific cancer, oropharyngeal cancer. The locations of the cancer clusters include the area directly to the east of the I-710 freeway and the southern portion of the Long Beach area. This cancer is typically associated with smokers, however, the effects could also be associated with the products of incomplete combustion (i.e., combustion from automobiles, trucks, and equipment). The lack of historical data analysis prevents further interpretation of the high-risk regions, air pollution could not be confirmed as the sole cause of the cancer clusters.
8. Studies have indicated that higher pollutant concentrations closer to the highway systems may contribute to higher adverse respiratory effects. In addition, the review of the Southern California cancer study shows high-risk census tracts bordering the eastern portion of the freeway between I-405 and the Port of Long Beach. Traffic emissions have not been confirmed as the sole cause of the high-risk.
9. Recent studies of school children in the SCAB have indicated that increased respiratory impacts and decrease in lung growth occur with increased NO_2, PM_{10}/$PM_{2.5}$, and O_3 concentrations. Data from these studies generally showed Long Beach to have one of the lowest concentration sets of these pollutants within the study area.

Limitations

Overall, sufficient measured data is lacking to provide a definitive health risk basis for the entire city region. Using a single data source to define relative cancer risks for the entire city the size of Long Beach is lacking rigor, especially with the variability of air toxic emissions that occurs within the city limits (see Figure ES-1). In addition, much of the available information is based on theoretical estimations or analyses and are either not supported by empirical data or do not meet statistical scrutiny to accurately assess actual health effects. For example, in the MATES II modeling phase of the study, the use of the model-predicted excess cancer risks resulting from an unsubstantiated model system has less scientific rigor than the ambient observed data. Modeled predicted concentrations were not compared with observed data to verify or validate the model's performance. In addition, the use of an episodic modeling system for annualized impacts is generally inappropriate. The resultant excess cancer risk modeled may provide a regional graphical representation of the generalized pathway, however, it does not necessarily reflect


ARTESIA FRWY
Council District No. 9
Council District No. 8
Council District No. 7
LONG BEACH FWY
Long Beach Airport
Council District No. 5
SAN GABRIEL FWY
SAN DIEGO FWY
Council District No. 6
PACIFIC COAST HWY
Council District No. 4
Council District No. 1
Council District No. 2
Council District No. 3
Port of Long Beach
1 0.5 0 1
Miles
City Boundary
Waterway
Freeway / Highway
SCAQMD Monitoring Site
Human Health Risk Assessment Study
Long Beach, California
FIGURE ES-1
SCAQMD Long Beach
Air Quality Monitoring Site
Prepared by:
MWH
MKJ/KLK
Date
12/01/04
JOB No. 1890882
FILE: GIS/LONGBEACH/FIGURE ES-1.MXD

representative risk levels in either an absolute or relative setting. Subsequent modeling in future efforts may take these concerns into effect.

The limited measured data has shown that the overall ambient air quality is better than the vast majority of the South Coast Air Basin (SCAB), but the lack of spatial data does not allow for the evaluation within specific areas. This is evidenced in the potential cancer clusters in sensitive areas to the west and south that were found by Dr. Mack. Since, 1) cancer development occurs over a long period of time, 2) the historical conditions associated with the cancer patients (length of residence, predisposition to cancer, health habits, etc.) is unknown, and 3) because site-specific ambient measurements in the immediate area is lacking, critical evaluation of the cause of the risk is not possible.

Finally, recent study results from the CHS program reveal that trends in NO_2, PM_{10}/$PM_{2.5}$, and O_3 concentrations can affect childhood lung growth, pulmonary function, and exacerbate respiratory conditions. However, the studies fail to interpret these trends relative to the overall range of concentration values or the normal variability in child respiratory or pulmonary functions. Without knowing all of the factors involved, estimating one parametric may provide misleading results.

Recommendations

In order to gain a better understanding of the conditions in sensitive areas, the following recommendations have been identified to assist the City of Long Beach in refining the current evaluation to develop the more detailed data to assess potential health risk concerns to its residences.

1. Provide active involvement into the SCAQMD MATES III and other future sampling programs. SCAQMD has started an intensive one-year study to assess current levels of cancer-causing toxic air pollutants and the risk they pose to Southland residents. The MATES III program began in mid-February, 2004, and follows the landmark MATES II, conducted in 1998-1999, and the seminal MATES, run in 1986-1987. The goal of MATES III is to update toxic air pollution levels and toxic emission inventories, and then input those data into a computer model of air dispersion to determine the cancer, as well as non-cancer, health risk from air toxics across the Southland. The study also will investigate potential toxic “hot spots” in communities. Providing input into monitoring selection, modeling procedures, and overall program design could provide Long Beach with valuable data to better evaluate the potential for health effects within the City’s boundary.
2. Encourage the SCAQMD to conduct an air-quality sampling program at potentially sensitive locations within the Long Beach City limits. The program should focus on the communities near the Port and the freeway system. The program could be conducted to simultaneously monitor vehicle combustion exhaust compounds for both indoor air at residences and outdoor air. Comparisons of the data could also be made with the SCAQMD monitored data to assess whether the District’s monitoring program is representative for all segments of the City.

3. Engage in discussions with Dr. Thomas Mack, University of Southern California, to evaluate the cancer-specific data associated with the oropharyngeal cancer clusters found in the western portion of the City. Additional studies could include obtaining and analyzing historical parameters associated with the oropharyngeal cancer patients and evaluating whether the cancer clusters associated with the tracts in Long Beach can be attributed to environmental pollution or affected by the cancer patients' genetics or other personal factors.
4. Request University of Southern California to conduct additional analyses on the Children's Health Study (CHS) study datasets. Additional studies can include the development of the appropriate ranges where the existing results are valid, evaluate their existing results with average child's variability (such as pulmonary growth, asthma attacks, and respiratory conditions), and assess the natural variability within the study groups. These analyses would provide a better understanding of the current CHS results and assessment of the effects upon Long Beach residents.

It should be also noted that the City of Long Beach has developed an Air Quality Element (AQE) to assist the City in addressing the appropriate air quality concerns in their decision-making process. The current AQE was developed in 1996, in cooperation with the SCAQMD and defines the specific requirements to meet the SCAQMD concerns. This document provides a significant amount of background information and a comprehensive listing of recommended actions for implementation on air quality issues in Long Beach. A copy of the current AQE is presented in its entirety in Appendix C. As such, the following recommendations are provided so the City of Long can continue active involvement in potential health concerns that may affect Long Beach residents.

5. Re-evaluate the City of Long Beach Air Quality Element (AQE). The existing AQE was developed in 1996 and establishes various policies and procedures to evaluate air quality concerns associated with development within the City limits. These include eliminating vehicle trips, reducing vehicle miles traveled, encourage alternative transportation (compressed natural gas, electric vehicles, other alternative fuels, mass transit), and minimize construction emissions (Appendix C). Numerous issues, including diesel particulate concerns, have surfaced since the development of the current AQE. SCAQMD has addressed these issues in their Model AQE (MAQE) related to the new $PM_{2.5}$ federal standards, land use planning near major roadways, and trip reduction planning (See Appendix D). Additionally, the draft MAQE identifies energy conservation within the building elements.
6. Become actively involved with the SCAQMD so specific issues related to Long Beach air quality can be addressed within the proper jurisdictional avenues. This involvement would position Long Beach to influence future regulatory requirements that could satisfy the concerns expressed by the residences of Long Beach, as well as meeting the City's planning programs.

BASELINE NOISE HRA

The City of Long Beach has addressed these noise issues via a pro-active and assertive approach to measuring, allocating, and controlling aircraft noise emissions from Long Beach Airport (LGB). The expressed goal has been to "operate an airport that maintains the highest possible environmental quality of life for surrounding neighborhoods while providing economic benefits and air transport vitality to the local area".

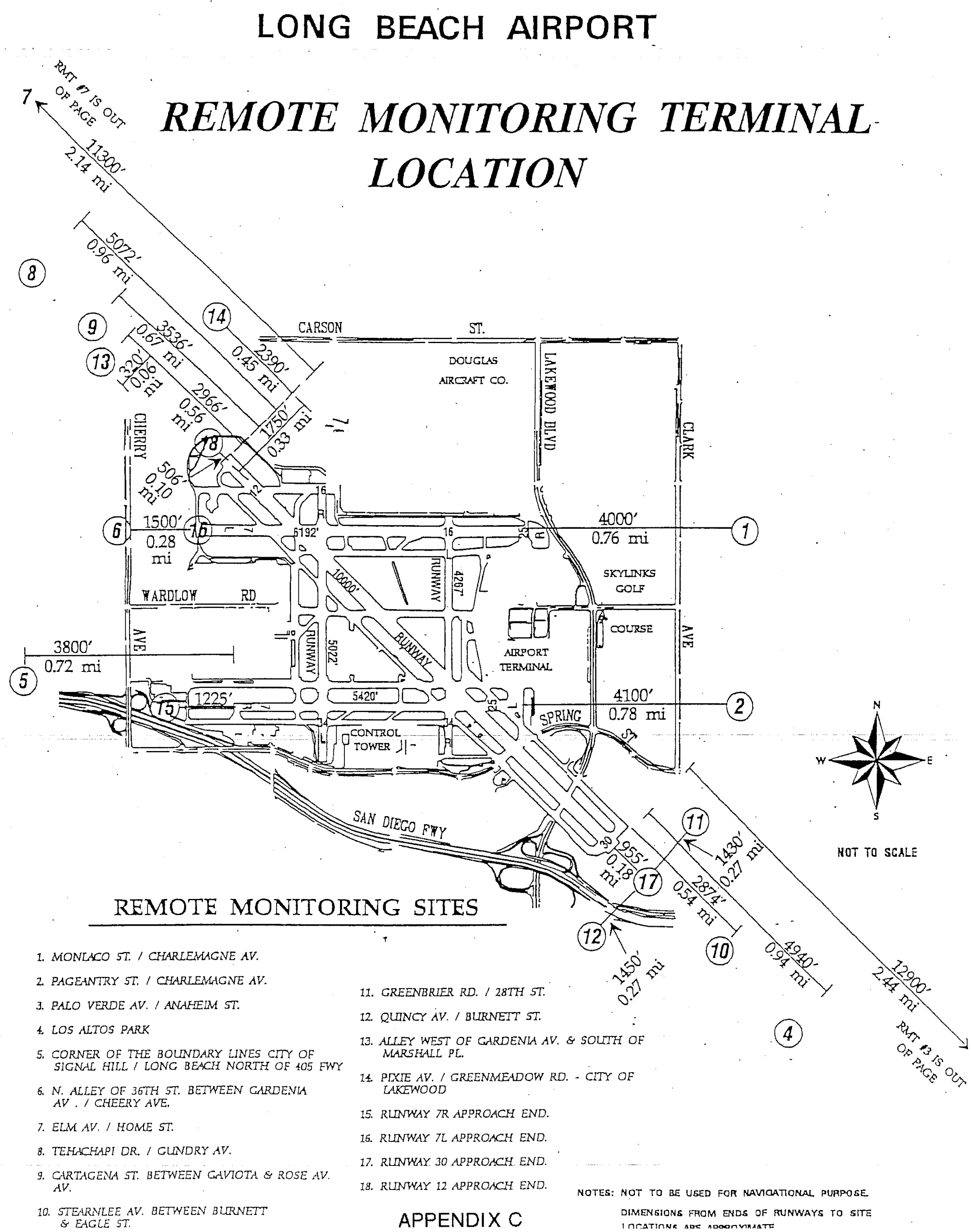
To achieve these goals, the City enacted one of the strongest airport-related noise ordinances in the country and, in the process, lengthy legal battles with the federal government to be able to implement them. The heart of the Long Beach ordinance (Long Beach Municipal Code 16.43), uses a noise allocation budget procedure wherein individual operations, as well as the airport as a whole, have prescribed noise emissions limits that cannot be exceeded without defined consequences and specific penalties. To track noise levels from aircraft operations, the airport Noise Office measures noise levels from every, single aircraft arrival and landing using a system of 18 noise monitoring stations strategically located around LGB. Full-time airport noise staff compile the data for submittal to an independent consultant, AAAI, Inc., to evaluate the data, compile the noise contour maps and the annual noise budget report. This extensive system of 'listening' stations, shown in Figure ES-2, sends 24-hour data into a state-of-the-art, multi-million dollar Airport Noise and Operations Monitoring System (ANOMS) and has a 99 percent identification rate of airport noise violators. Relevant airport-related noise information has been measured since 1984 and is available as a matter of public information.

Methodology

The noise assessment was designed more specifically to assess the potential for noise from the airport activities (primarily take-offs and landings) to have health effects on the surrounding community rather than the nuisance impacts typically associated with noise concerns. Despite the same equivalent noise level, intermittent noises – such as usually emitted by air and rail traffic sources – are considered to disturb much more than more continuous noises, such as those caused by high-density (urban) road. Further, given the significant difference in fundamental acoustical properties, including spectral content, temporal variations, and propagation pathways into living spaces, aircraft noise sources can be more intrusive than roadway sources, such as major arterials or highways. Lastly, given the elevated source of noise from aircraft, a larger area is potential affected from fly-overs than from roadway drive-bys; making aircraft operations a higher concern from a public health protection standpoint

Over 150 literature citations were evaluated for the noise HRA (See Appendix B). The analysis included the review of health effects, such as hearing loss, cardiovascular effects, mental health effects, stress, and sleep loss. In addition, the HRA evaluated known standards and applied these to existing monitoring noise data measured around the airport property.

Figure ES-2. LGB Noise Monitoring Stations



Findings

Based upon the literature, human health effects associated with excessive noise have been demonstrated for a wide variety of concerns. The key results of the noise baseline HRA are as follows:

1. On-going noise monitoring data has been recorded at the Long Beach Airport since 1984. This history of noise level data around the airport is processed into several periodic reports (daily, monthly, quarterly, and yearly); many of which are readily available on-line at www.longbeach.gov/airport/noise_abatement. A comparison between the 1984 and 2004 Community Noise Equivalent Level (CNEL) standard contours around the airport shows that the pertinent 65 dBA contour area has diminished significantly, primarily due to increasingly quieter jets, as well as from assertive and effective management of airport operations. Currently, this key contour line does not extend over any residential areas surrounding the airport.
2. Sleep deprivation can induce anxiety responses, elevated blood pressure, and increased heart rate. However, there has been no correlation of sleep deprivation with specific noise levels (Figure 6-2, page 60).
3. Continuous long-term exposure to 65-70 dBA equivalent noise levels [$L_{eq(24\ hr)}$] has been demonstrated to cause cardiovascular effects that can lead to hypertension, arteriosclerosis or myocardial infarction. However, most of these findings have been criticized by the research community because the associations are usually weak, only the average risk has been considered, and sensitive sub-groups have not been sufficiently characterized. Thus, there are no conformable correlations between cardiovascular effects and community noise levels around LGB. Of even greater importance to this study, though, is that the airport-related noise levels around LGB are well below these studied levels; most of the city is expected to be in the range of 55 to 65 dBA CNEL.
4. Noise levels have not been demonstratively linked with mental health concerns, although some studies have indicated that there have been identifiers, including increased mental hospital admission rates, depression, and headaches in high noise exposure areas. However, other factors unrelated to noise prevented the causal link.

Limitations

Beyond obligatory compliance with noise regulations, the general noise environment around the airport is consistent with evaluation standards that are based on broad community health and welfare guidelines. However, at this time, standardized experimentation methods, reliable clinical data, quantitative assessments, and cause-effect relationships are not adequately defined or established to allow or facilitate a proper risk assessment of noise-related health effects.

Given this lack of quantifiable relationships, no formal risk assessment can be conducted and no community health strategy is definable, measurable, or enforceable.

Recommendations

Based upon the current levels at the airport, no further recommendations are warranted at this time other than the continuation of the existing programs that are currently in place. These include the:

1. Preservation of the City of Long Beach Noise Compatibility Ordinance, Municipal Code 16.43 (See Appendix I),
2. Maintaining the Airport Noise Office and its aircraft noise monitoring function, including the 18 community noise monitoring stations and the Airport Noise and Operations Monitoring System (ANOMS),
3. Continue the assertive, existing airport noise control and mitigation procedures and policies, and
4. Monitor future research regarding scientific evidence (i.e., a definitive cause-effect relationship) for aircraft noise-induced public health effects.